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\*Vocational Education

IDENTIFIERS \*Colorado

#### **ABSTRACT**

This handbook, which is intended for K-12 teachers in Colorado, explains how to integrate academic content standards and assessments with workplace competencies and school-to-career activities. The handbook is divided into four sections. The first presents the Colorado General Workplace Competencies, which describe the skills and knowledge students need to be successful in most careers and in college. The competencies are organized into five categories: communication; organization; thinking; technology; and worker qualities. The second section, titled "Opportunities for Success," offers guidelines for educators as they help special populations of students meet academic content standards and participate in school-to-career opportunities. Section 3 features grids providing examples of how the Colorado General Workplace Competencies cross-reference with the Colorado Model Content Standards for mathematics in grades K-4, 5-8, and 9-12. Each grid is followed by examples of classroom strategies combining a specific academic content standard, career development activity, general workplace competency, and assessment strategy. Quotations included throughout the handbook provide the perspectives of Colorado educators, business leaders, and students on integrating workplace competencies and academic content standards. A sample rubric constitutes the fourth section. Concluding the handbook are the addresses of Colorado's six school-to-career regional resource centers. (MN)

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# MAKING STANDARDS WORK!

A TEACHER'S GUIDE TO INTEGRATING ACADEMIC CONTENT STANDARDS AND ASSESSMENTS WITH WORKPLACE COMPETENCIES AND SCHOOL-TO-CAREER ACTIVITIES.





MATHEMATICS

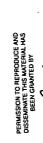














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abilities, plan realistically for their future and develop basic skills that "... I have become convinced that it [school-to-career] is ... a way of helping all students, including the college-bound, assess their will serve them in whatever they may undertake."

- Frances Moore, Vice President Thompson Board of Education



# MAKING STANDARDS WORK ACKNOWLEDGEMENTS

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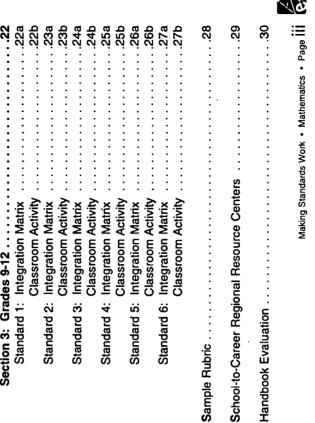
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### NATRODUCTION

As educators we strive to reach every student in our classrooms. We measure our success when students grasp a new concept, move successfully to the next grade level or achieve recognition for their skills and abilities. However, the ultimate test is often when we see former students as adults. We want to know about college, their job and family and if they are happy with their lives. When students are successful, we are proud of the role we played in their development. When students struggle with the transition from school to post-secondary education and/or work, we often step back and reflect: Did we do enough to prepare students for life after school? What makes the difference between those students who are successful and those who are not?

Making Standards Work is a tool to help educators weave academic content standards, assessments and school-to-career methods into an integrated and comprehensive educational strategy that prepares all students to meet their future goals. The examples contained in this publication were created by Colorado educators to provide a vision of how teachers can deliver instruction in ways that help students reach high academic standards, develop effective work habits and gain career knowledge. Handbooks for other academic content areas are currently under development.

### Standards and Assessment

Colorado enacted legislation in 1993 to adopt a standards-driven system of education. Public support for this reform is high and 48 other states have developed, or are in the process of developing, standards for what students should know and be able to do at various points in their schooling.

Standards-driven reform is based on the premise that students can achieve more if the expectations for learning are clearly defined, if students know in advance the criteria for meeting those expectations and if teaching and assessment support the expectations and reinforce student effort. Standards enhance accountability by

focusing on student results, not on the curriculum, educational program or other "inputs" used by a particular school.

Colorado's model content standards represent the consensus of thousands of parents, educators, administrators, employers and interested community members. The standards were developed through a two-year process that involved three publicly reviewed drafts, approximately 10,000 responses to these drafts and a series of regional meetings across the state.

The standards reflect a "thinking" curriculum - one that requires students to know basic skills, to communicate effectively to solve problems, and to understand and apply academic principles and tools. They define a set of skills and knowledge that will prepare Colorado students for employment, citizenship and life-long learning in the new century.

### Changes in the Workplace

The national economy is undergoing major changes that have an impact on both the opportunities available to workers and the expectations and needs of their employers:

- The number of jobs that employ unskilled workers is rapidly diminishing. Those
  jobs that do exist increasingly fail to pay a living wage.
  - The income gaps among workers who dropped out of high school, those who
    graduated from high school, those who have an associate degree and those
    with a bachelor's degree are significant and growing.
- New technologies and services continue to emerge rapidly. Nearly 50% of employers use equipment less than four years old. On average, 42% of nonmanagerial employers now use computers in their work.
- The growth of new information and knowledge is exploding, doubling in a span of ten to fifteen years.

Schools must change as well to ensure that they are preparing students who can succeed in this dynamic environment.

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# Colorado School-to-Career Partnership

The Colorado School-to-Career Partnership is a statewide effort assisting local schools and communities to develop a K-16 learning system that promotes attainment of high academic standards, career development and workforce preparation for every student.

Academics and career development are integrated in classrooms and worksite experiences, and aligned with content standards and assessment. There are currently 91 local School-to-Career Partnerships in Colorado representing 140 school districts. An estimated 209,000 K-16 students have already participated in one or more school-to-career activities and the momentum continues to build in communities around our state.

### Using this Handbook

Making Standards Work is divided into four sections:

- Workplace Competencies: This section presents the Colorado General Workplace Competencies, which were developed by a business task force of the Colorado Association of Commerce and Industry. These competencies describe the skills and knowledge students need to be successful in most careers and in college. The competencies are organized into the following categories:
  - Communication
- Organization
  - Thinking
- Technology
- Worker Qualities

These workplace competencies must be intentionally taught and assessed to assist students in transferring classroom learning to the world of work and to post-secondary education.

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- II. Opportunities for Success. This section offers guidelines for educators as they help special populations of students, who have diverse and sometimes very unique needs, meet academic content standards and participate in school-to-career opportunities.
- In Colorado, Access Skills are those skills that all students must demonstrate in order to succeed with academic content standards and in the workplace. Access Skills are a combination of the Colorado General Workplace Competencies and the Essential Learning Principles defined in Opportunities for Success.
- III. Integration Matrices and Classroom Activities: This section features grids that provide examples of how the Colorado General Workplace Competencies cross-reference with the Colorado Model Content Standards for mathematics. To help educators think about how to integrate the workplace competencies into their mathematics instruction, the grids are followed by examples of classroom strategies that combine a specific academic content standard, career development activity, general workplace competency and assessment strategy.

Quotes and Resources: Through the quotations, Colorado educators, business leaders and students (with parental consent) offer their perspectives on integrating workplace competencies and academic content standards. The featured resources provide a starting point in locating additional integrated curriculum, work-based learning opportunities or connecting activities. They also may offer helpful information for expanding current educational strategies.

Activities and resources included in this handbook are intended for use at the discretion of local districts. They have not been endorsed or ratified by any official Colorado State body.

IV. <u>Sample Rubric</u>: A rubric is a descriptive measurement for defining what a student knows and can do. An assessment rubric, aligned with the integrated learning activity on page 24b, is included in this section. Educators can use this example to create additional rubrics to assess student learning.



# I. WORKPLACE COMPETENCIES

The Colorado General Workplace Competencies were developed by a business task force of the Colorado Association of Commerce and Industry, in conjunction with the Colorado Department of Education and the Colorado School-to-Career Partnership. These competencies represent the skills that post-secondary students and workers need in most jobs regardless of the specific occupational area.

These competencies will help educators and students understand the skills and knowledge students need to succeed in higher education and the workforce. The competencies also provide Colorado businesses with a consistent set of standards that promote a skilled workforce.

Communication Skills - Demonstrates the ability to receive and relay information clearly and effectively

<u>Listening</u> - receives, attends to, understands and responds to verbal and nonverbal messages

Speaking - clearly organizes and effectively presents ideas orally

Reading - locates, understands and interprets written information in prose and documents to perform tasks

Writing - organizes and effectively presents ideas and information in writing Interpreting - delineates and analyzes oral and written information and

Interpreting - delineates and analyzes oral and written information and synthesizes information into a conclusion

Negotiating - works toward agreement while maintaining position <u>Persuading</u> - communicates ideas to justify position, overcome resistance and convince others

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Organizational Skills - Demonstrates the ability to work effectively and efficiently

<u>Planning</u> - devises and outlines a process to achieve a goal and timeline <u>Time Management</u> - applies appropriate time to task and manages multiple priorities

Using Resources - identifies, organizes, plans and allocates resources Systems Thinking - understands the nature of systems, develops and adapts systems to meet organizational needs

Evaluating - collects, evaluates and uses data to monitor and improve performance

# Thinking Skills - Demonstrates the ability to use reasoning

Problem Solving - identifies and recognizes a problem, considers alternatives, devises and implements a logical plan of action

<u>Decision Making</u> - uses a process to identify goals and constraints, evaluates alternatives and reaches a conclusion

Creative Thinking - generates new and innovative ideas

Leaming - uses efficient techniques to acquire and apply new knowledge and skills

Analyzing - identifies bias of information sources, evaluates contradictory information and effectively manages information

<u>Mathematics</u> - performs basic computations and solves practical problems by applying appropriate mathematical techniques

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# Worker Qualities - Demonstrates the charactenistics of an effective worker

Self-Management - demonstrates punctuality, readiness to work, initiative and the capacity for life long learning and personal growth

<u>Ieam Member</u> - contributes to group effort through cooperation and consensus <u>Responsibility</u> - follows through consistently with honesty and integrity

Elexibility - shows versatility and the ability to change Leadership - creates a direction/vision for others to follow, aligns management methods with vision and implements a system of accountability

Works with Diversity - accepts differences and works well with individuals from a variety of backgrounds and/or with divergent philosophies or ideas

**Technology Skills** - Demonstrates the ability to work with a variety of technologies and equipment

Demonstrates Computer Literacy - uses keyboarding skills, computer programs and understands basic computer operations

Selects Technology - chooses appropriate procedures, tools or equipment Applies Technology - understands overall intent of and proper procedures for using selected technology and equipment

<u>Uses Technical Information</u> - interprets and uses data generated from a variety of technological devices

Note: Technology refers to any device, tool or piece of equipment that facilitates or supports efficient completion of work, including machinery, computers, scientific equipment, fax machines, voice mail, overhead projectors, VCRs, cash registers, and calculators.

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# II. OPPORTUNITIES FOR SUCCESS CUIDELINES FOR BRINGING OUT THE BEST IN ALL OF OUR STUDENTS

"Opportunities for Success" was created through a process that engaged over 2,100 Colorado educators, parents and citizens from across the state and drew on the expertise of national professional organizations. Its purpose is to provide guidelines for educators as they help special populations of students, who have diverse and sometimes very unique needs, meet academic content standards.

These guidelines may be useful to:

- Curriculum directors as they coordinate and develop curriculum and instruction around standards
- Classroom teachers as they plan for their students
- Assessment professionals as they develop district and classroom assessments
- Building level planning committees as they work on school improvement afforts

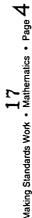
### A. GENERAL PRINCIPLES

The four areas described below (Essential Leamings, Classroom Practices, Assessment Practices and Service Options) are designed to assist special needs students gain the skills necessary to reach high academic standards.

Essential Learnings - the knowledge and skills that special needs students require to maximize their educational growth and development.

Students who are diverse learners need to learn:

1. Communication skills to express and understand thoughts and opinions in a variety of settings, situations and with diverse populations.



- 2. Decision making and problem solving skills and strategies.
- Basic language skills and a broad vocabulary to use as building blocks in developing reading, writing and critical thinking.
- Self-advocacy skills to make their needs and wants known in socially constructive ways in learning, work and social situations.
- Personal strengths and capabilities and the ability to use this knowledge to act responsibly at school and work.
- Social skills to develop positive relationships with peers and adults in a variety of settings and situations and with diverse populations.
- Organizational skills and study strategies for school and work. Important skills include, but are not limited to:
- Time management
  - Goal setting
- Management and use of materials/resources
- Learning strategies
- Career development skills to make, pursue and maintain personal employment choices.
- The use of tools and technology to augment learning and access information.

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<u>Classroom Practices</u> - the range of instructional practices and strategies that teachers employ to help a special population of students learn. These include, but are not limited to:

- Time
- Space
- Modality
- Grouping
- Presentation
- Classroom organization and behavior management
- Materials
  - **Equipment**
- Technology
- Environment

With the needs of diverse leamers in mind, educators need to employ appropriate:

# 1. Student Self-Management Strategies

- Use strategies designed to promote student self-management and independence.
- Provide consistency, structure and clear expectations.
- Provide appropriate positive learning reinforcement, feedback and recognition for student accomplishment.

# 2. Setting for Instruction and Learning

- Promote supportive and responsive climates that facilitate social and cultural learning and allow students to take risks and learn from failure.
- Provide opportunities and environments that allow all students to participate meaningfully in instructional and social activities.

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Adapt physical environments to match the learning needs of students.

### 3. Instructional Practice

- Incorporate life skills, social and affective skills and self-advocacy skills throughout the curriculum
- Choose teaching and learning methods that match the learning needs and styles of the students.
- Incorporate direct instruction of how-to-learn skills and thinking skills throughout the curriculum.
- Ensure the language of instruction effectively communicates and promotes student understanding for students with special needs.
- Use methods to promote active leaming, including hands-on learning, real-world and experiential leaming, community-based learning and learning involving student choice.
- Use learning materials, equipment and media tailored to the unique learning needs of students.
- Design and implement specific opportunities for students to apply and transfer learning to a variety of situations, both familiar and new.
- Use varied and flexible grouping strategies for instructional purposes.
- · Use flexibility in pacing instruction, scheduling and the use of time based on the needs of individual students.
- Communicate and collaborate with other teachers, specialists, students,

families and appropriate agencies in planning and implementing effective instruction. Assessment Practices - the accommodations and adaptations necessary for special population to adequately demonstrate knowledge and skills.

In assessing the learning of diverse learners, educators need to:

- 1. Allow for a variety of assessments that evaluate what is being taught, including:
- Portfolios
- Assessment of daily work
- Observations
- Self and peer evaluations
- Demonstrations and projects
- Oral tests
- Cooperative group assessments

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- Family, community and employer evaluations/observations
- language used during instruction and reflects the student's preferred mode Ensure that the language used in assessment is consistent with the of communication, considering the: ۲i
- Student's culture/preferred language
- Clarity of instructions
- Verbal and non-verbal options (i.e., sign language)
- 3. Consider the student's unique needs when determining the content of the assessment.
- Identify the skills and content to be assessed and ensure that assessments test only the content that was taught.

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- Design assessments to determine what the student knows as opposed to what the student does not know.
- Utilize student's prior knowledge to determine instruction and subsequent assessments.
- Identify individual learning styles and design assessments to elicit a variety of thinking and application skills.
- Design assessment procedures and accommodations to meet individual student needs.
- Assess in the student's primary communication mode (i.e., Braille, sign language, picture board).
- Use a variety of people (i.e., family, peers, employers, other professionals) in the assessment process.
- Use technology for presentation of assessment and student response.
- 5. Allow flexibility in the time and scheduling of assessments.
- Allow extended time.
- Allow the student to take breaks.
- Divide assessments into smaller segments.
- Schedule assessments when students can perform best.
- Use untimed assessments.

**3**2

- Allow for a variety of assessment environments. Consider the purpose of the assessment and the student's unique needs and choose the environment that fits best.
- Consider the student's physical condition, endurance, attention span, distractibility, emotional state and medical condition, at the time of assessment.
- Control for distractions.
- Create supportive settings that encourage student participation.
- Use preferential seating.
- Use real life settings and other alternative environments.
- Consider the evaluation criteria that will be used when designing assessments and set the criteria prior to assessment.
- Involve others in determining realistic expectations and goals for the student.
- Provide family and others the opportunity to assist in interpreting assessment results.
- Make expectations and criteria clear and explicit.
- Provide a variety of grading methods, including:
   Individual grading scale
  - Narrative reports
    - **Group grades**

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Service Options - systems of organizing people and materials to supply and deliver educational opportunities, accommodations and supports in order for students or given populations to become successful learners.

For diverse leamers to have adequate opportunities to leam, schools will:

- 1. Involve families, community members and peers integrally in the design and implementation of educational services for all children and youth.
- program, time and administrative processes to meet students' needs and 2. Use shared and flexible resources, including personnel, money, facility, to offer appropriate services by providers with specific expertise.
- learning environments, grouping, accommodation of multiple learning Offer curriculum and instruction that is diversified through a variety of styles, setting appropriate expectations, student-teacher ratios and a modifications, including alternative scheduling, accessibility, optimal variety of instructional techniques. က်
- family members, the community and other agencies with the management Support collaborative planning with individual students, team members, of time and resources. 4
- management, including safety, health, wellness, social relationships and Design support services for students that help them with life Ŋ.
- adjustment after high school, including career development, community involvement, post-secondary education, recreation and leisure choices, 6. Assure students the opportunity to plan and prepare for successful life and daily living activities.
- 7. Maximize the use of technology for learning. School professionals,

families, and students use technology competently.

- 8. Offer a menu of educational opportunities to students, families and school personnel for continuous improvement of services to students
- 9. Offer support services to assist students in managing behavior, expressing needs, developing friendships, resolving conflicts, making choices and planning their lives.

### B. ADAPTATIONS

Adaptations are based on the strengths and needs of individual students and may Adaptations are changes made to the environment, curriculum, instruction and/or assessment practices in order to help a student become a successful learner. vary in intensity and degree.

Adaptations include:

### 1. Accommodations:

demonstrate what they know. Accommodations include changes in and/or level, content or the performance criteria. The changes are made in order demonstrates leaming. They do not substantially change the instructional to provide students equal access to learning and an equal opportunity to Accommodations are adjustments made in how a student accesses and provisions for the following:

- Presentation and/or response format and procedures
  - Instructional strategies
    - Time/scheduling
      - Attitudes
- Architecture
- Environment
- Equipment

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#### Modifications: ٦i

Modifications are substantial changes in what a student is expected to experiences and environments. Modifications include changes in the opportunities to participate meaningfully and productively in learning learn and demonstrate. They are made to provide students with following:

- Instructional level
- Content
- Performance criteria

Special Education Individualized Education Plan (IEP) to qualify for modifications to \* Note: Under Colorado Law 22-7-407 et. seq. C.R.S., a student must have a the standards, unless the modifications exceed those of district/state content standards.

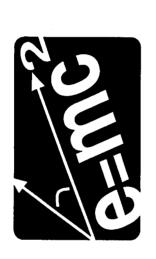
Opportunities for Success contains many strategies for specific special population groups including:

- Attention Deficit Disorder
  - Chapter I (Title 1)
- Deaf/Blind
- Deaf/Hearing Impaired
- Gender
- Gifted Individuals
- Leaming Disabilities (Perceptual/Communicative) Language Minority Students
  - Migrant Students
- Physically Disabled and 504
- Prevention Initiatives (High-Risk)
- Significant Cognitive Challenges
- Significant Identifiable Emotional Disabilities
  - Speech/Language Needs
- Traumatic Brain Injury
  - Visual Disabilities

The complete version of Opportunities for Success can The Colorado Department of Education be purchased for \$18.00 by contacting: Special Education Services Unit 0699-998 (606) 27

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# GRADES K-4



# III. INTEGRATION MATRICES AND CLASSROOM ACTIVITIES INTEGRATING MATHEMATICS STANDARDS WITH WORKPLACE COMPETENCIES



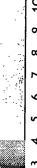
WORKER QUALITIES
Demonstrates the characteristics
of an effective worker

Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.

TECHNOLOGY SKILLS
Demonstrates the ability to work
with a variety of technologies THINKING SKILLS
Demonstrates the ability
to use reasoning ORGANIZATIONAL SKILLS
Demonstrates skills to effectively and
efficiently operate within a workplace COMMUNICATION SKILLS
Demonstrates the ability to receive and relay
information clearly and effectively

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GRADES K-4 BENCHMARKS demonstrating meanings for whole	numoers, and commonly-used inacros and decimals, and representing equivalent forms of the same number through the use of physical models, drawings, calculators, and computers	reading and writing whole numbers and knowing place-value concepts and numeration through their relationships to counting, ordering, and grouping	using numbers to count, to measure, to labe, and to indicate location	developing, testing, and explaining conjectures about properties of whole numbers, and commonly-used fractions and decimals	using number sense to estimate and justify the reasonableness of solutions to problems involving whole numbers, and commonly-used fractions and decimals	
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4 and number relationships in problem-solving situations and communicate the reasoning used in Students develop number sense and use numbers <del>-</del> 0 ∞ Ø

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decimals

using number sense to estimate and justify the reasonableness of solutions to problems involving whole numbers, and commonly used fractions and

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solving these problems.

Thinking Skills: Learning uses efficient techniques to acquire and apply new knowledge and skills

#### RESOURCE

#### CONNECT

Everyone Can Do Math and Science

Colorado Statewide Systemic Initiative for Methematics and Science

increase the achievement of all Colorado students in science and mathematics, kindergarten through baccalaureate (K-16) CONNECT is charged to provide support and leadership to

1580 Logan Street, Suite 740 Denver, CO 80203 (303) 894-2140

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# **MATHEMATICS**



### LEARNING ACTIVITIES

#### a dollar, 100 years in a century, 100 centimeters in a meter, etc.). Students add a penny to the 100 chart each day, comparing the value to 100 (25/100, .25, 25%). This work can be applied to other concepts (money exchange, addition, (10X10 squares). The class discusses "100's" (100 pennies in Students create a bulletin board that contains a "100 chart" ACADEMIC CONTENT STANDARD

## WORKPLACE COMPETENCY

subtraction, etc).

### THINKING SKILLS: LEARNING

Then using calendars, students determine the 100th day. They In groups of three, students estimate the 100th day of school also must express numerically the current day out of 100 (fraction, percentage, etc.).

# CAREER DEVELOPMENT/COMMUNITY

decimals, or estimation and discuss how these skills are used Students identify three careers that use fractions, percents. neighbors, or other community members or using internet on the job. This can be done by interviewing parents, resources or study trips (for any subject).

### **ASSESSMENTS**

# ACADEMIC CONTENT STANDARD

100 (decimals, fractions, and percents) by accurate calculations Students demonstrate an understanding of 100 and parts of in the 100th day of school activity.

### **WORKPLACE COMPETENCY**

THINKING SKILLS: LEARNING Evaluate the students on their ability to:

- present to the class their 100th day of school activity
- identify the process/justification for their answer, and describe how and what they learned.

#### EXTENSIONS

- currencies from different countries as part of a geography · This activity can be applied to money exchanges, using
- Communication skills may be practiced and assessed in the classroom presentation of this activity.
- (demonstrating meanings for whole numbers, and commonly This activity also addresses benchmark "a" of this standard used fractions and decimals, and representing equivalent forms of the same number through the use of physical models, drawings, calculators, and computers).

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Making Standards Work • Mathematics • Page 10b



used in solving these problems.			INIOINI	mormanon clearly and enectively	у апотепе	riiveiy		elliciellity operate vittilli a volupiace	Operate										ĺ		•				
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GRADES K-4 BENCHMARKS	ods Cullers!	Cupeat		No dou	Tenes .		( QL)	A CIL	Sueners Sue	<b>~</b>	enike to tok the ties	THEOLO	THE	50	TO SECOND	HOLLOS	EL ST	9% \	Y SO	LEN	· U. \	lidisely itods et	Ceo;	Estand State Of State	<b>(8)</b>
a. reproducing, extending, creating, and describing patterns and sequences using a variety of materials							0807 S 0200		. : 245. Jan 1923.						<u> </u>			<ul><li>(2) (1) (2) (2) (2) (2)</li></ul>	37.4.3.4		#EE.F/##################################				
b. describing patterns and other relationships using tables, graphs, and open sentences	•							*		•				•		:	•			•					
c. recognizing when a pattern exists and using that information to solve a problem								. •		•				•											
d. observing and explaining how a change in one quantity can produce a change in another		•	•						•	•			•				_								
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34									too			<u> </u>									က	יטו			



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2. Students use algebraic methods to explore, model, and describe pattems and functions involving numbers, shapes, data, and graphs in problemsolving situations and communicate the reasoning used in solving these problems. #



describing patterns and other relationships using tables, graphs, and open sentences



understands the nature of systems, develops and adapts systems to meet organizational Organizational Skills: Systems Thinking

#### QUOTATION

"Math makes you smart -- you need to be smart to get an education and to get a job."

Jefferson County R-1 - Chris, 3rd Grade

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## LEARNING ACTIVITIES

# ACADEMIC CONTENT STANDARD

aware of different ways numbers are used. While on the "math walk," students notice the use of street addresses and identify Students go on a "math walk" in the community and become any number patterns associated with these. Students take notes during the "math walk" and, as a class, discuss any As a class, students brainstorm uses of numbers in the community (license plates, street numbers, time, etc.). questions that may arise

### **WORKPLACE COMPETENCY**

#### works. The discussion includes the process that each piece of mail must go through to get to its final destination (use of a zip As a class, students discuss how the system of mail delivery code, city and state, and street address). Students identify ORGANIZATIONAL SKILLS: SYSTEMS THINKING

# CAREER DEVELOPMENT/COMMUNITY

elements of a system.

Invite a guest speaker to the classroom or take a study trip to workplace. For example, a postal worker, or delivery person their destinations. Students identify businesses they saw on the "math walk" and determine the types of careers involved. may discuss how he/she uses pattems in addresses to find a place of business to explore patterns used in the Math concepts should be tied to this discussion

#### **ASSESSMENTS**

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**MATHEMATICS** 

ACADEMIC CONTENT STANDARD

pattems using mathematical language. Students are assessed guest speaker/study trip. The stories must include two number incorporating information obtained during the "math walk" and Students work together in small groups to write short stories on the accuracy of their use of numbers and patterns in the short stories.

### **WORKPLACE COMPETENCY**

speaker/study trip may be used as resources in developing the In the short stories, students refer to how systems are used in the community or workplace. The "math walk" and the guest ORGANIZATIONAL SKILLS: SYSTEMS THINKING stories. Students identify three criteria of a system

#### EXTENSIONS

 Students create story problems using information and ideas speaker/study trip. Other students present their solution to they obtained during the "math walk" or from the guest the problems to the class.

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Making Standards Work • Mathematics • Page 11 D





Academic Content Standard

Workplace Competencies

Demonstrates the characteristics of an effective worker **WORKER QUALITIES** 39 TECHNOLOGY SKILLS
Demonstrates the ability to work
with a variety of technologies × THINKING SKILLS
Demonstrates the ability
to use reasoning Change of the Control GLINEN LOSO & ORGANIZATIONAL SKILLS
Demonstrates skills to effectively and
efficiently operate within a workplace Guieners Ourinit suggests COMMUNICATION SKILLS
Demonstrates the ability to receive and relay information clearly and effectively Gulleys! Students use data collections and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems. **GRADES K-4** constructing, reading, and interpreting displays of data including interpreting data using the concepts of largest, smallest, most often, and middle generating, analyzing, and making predictions based on data obtained from surveys and chance devices tables, charts, pictographs, and bar solving problems using various strategies for making combinations BENCHMARKS

e-mc

Making Standards Work • Mathematics • Page 12 &





9 Q Students use data collections and analysis,

STATERD

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situations and communicate the reasoning used in statistics, and probability in problem-solving solving these problems.



d. solving problems using various strategies for making combinations



Worker Qualities: Team Member contributes to group effort through cooperation and consensus

#### QUOTATION

"Math is the most important part of music, even more important than notes. If you play any music with a beat, you've got to have math."  Dizzy Gillespie Jazz Trumpet Player

Share with the class several examples of actual employee work

CAREER DEVELOPMENT/COMMUNITY

schedules from community businesses, such as fast food

restaurants, department stores, gas stations, etc.

about job requirements and how employees use math in their Students visit a business with their family in a career area of interest. Students look at the worker schedule and also ask

jobs. Students report their findings to the class.

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## BEMC BEMC BEMC

LEARNING ACTIVITIES

# **MATHEMATICS**

### **ASSESSMENTS**

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information must be presented in the form of a matrix or chart and it must accommodate the employees' needs. The matrix Assess students on the schedule matrix they create. The also will be evaluated on the accuracy of the students' mathematical computations.

Four employees need to be included in the work schedule for a

week (Renee, Daniel, Amy and Jeff). The schedule must

· the business is open Monday through Saturday

accommodate these needs:

an employee work schedule in the form of a matrix or chart.

Students work in pairs as co-managers of a business to create

ACADEMIC CONTENT STANDARD

ACADEMIC CONTENT STANDARD

### WORKPLACE COMPETENCY

### Students write a summary of how they worked together as WORKER QUALITIES: TEAM MEMBER

co-managers including:

all employees do not have to work the same number of days

Renee prefers to have two days off in a row (this includes

Sunday

Daniel cannot work on days that start with "T"

Amy cannot work on weekends

Jeff likes to have a day off in the middle of the week

each day must have exactly three workers

- how decisions were made
   how disagreements were resolved
   identification of two places outside the classroom that use teamwork.

#### EXTENSIONS

Have a class discussion on the meaning of team work including

WORKER QUALITIES: TEAM MEMBER

**WORKPLACE COMPETENCY** 

consensus and group norms such as treating each other with

respect, listering to each other's ideas, agreeing on the outcome, etc. Students identify other places teamwork is used

(at work, at home, in sports, etc.).

Students solve logic puzzles that use matrices in order to become familiar with different types of matrices.

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relationships in problem-solving stitutions and communicate the reasoning used in solving these problems.	ns and ing these		CO Demonst	COMMUNICATION SKILLS Demonstrates the ability to receive and information clearly and effectively	ATION pility to re arly and e	SKILLS teive and flectively	relay	ORC Demon	ANIZA strates s tty opera	OPGANIZATIONAL SKILLS emonstrates skills to effectively an fliciently operate within a workplac	ORGANIZATIONAL SKILLS Demonstrates skills to effectively and efficiently operate within a workplace	and		THINI Demons to us	THINKING SKILLS Demonstrates the ability to use reasoning	KILLS e ability hing		TEC Demo with	TECHNOLOGY SKILLS temonstrates the ability to work with a variety of technologies	TECHNOLOGY SKILLS Demonstrates the ability to work with a variety of technologies	to work logies	Dem	Of an e	OHKER GOALITE INStrates the character of an effective worker	WOHNER GOALITIES Demonstrates the characteristics of an effective worker
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BENCHIMARKS  a. recognizing shapes and their relationships using a variety of materials	<b>y</b>					<u> </u>	<b>?</b>			V2007(888	V - 1839 (1872 1888)	*	>	Almanda	•		<u> </u>	<b>▼</b> 38000000000000000000000000000000000000	\$15,60°, \$10,80°, \$250°		. 32.360 (. 398)				
<ul> <li>b. Identifying, describing, drawing, comparing, classifying, and building physical models of geometric figures</li> </ul>		•	•					_		•	•	•	•	•	•					. •		•		_	
c. relating geometric ideas to measurement and number sense														•	•							(100 j.a.			
<ul> <li>d. solving problems using geometric relationships and spatial reasoning</li> </ul>									•	•			•		•										
e. recognizing geometry in their world			<u> </u>						•			•	•		•										1
42			31. · · · · · · · · · · · · · · · · · · ·																		7 M - 1 M -	<u> </u>			



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Students use geometric concepts, properties, and communicate the reasoning used in solving these relationships in problem-solving situations and problems. recognizing shapes and their relationships using a variety of materials

BENCHMARK



generates new and innovative Ideas Thinking Skills: Creative Thinking

#### QUOTATION

"I think you need to know math to do everything. If you need something to eat and it costs \$10.50, then you will know how much to give and how much change to expect. Also, you tell time with math." - Ashley, 3rd Grader Jefferson County R-1

**7 7** 

## **LEARNING ACTIVITIES**

# ACADEMIC CONTENT STANDARD

Grandfather Tang's Story by Ann Tompert and Robert Andrew Parker. Students will explore tangrams and tangram puzzles. Teacher introduces tangrams by reading the book entitled

## **WORKPLACE COMPETENCY**

Teacher leads a discussion on creativity. Students identify THINKING SKILLS: CREATIVE THINKING

creativity by describing something (i.e., a monster) and asking the students to create a picture of the thing using the shapes creativity. While the students explore tangrams, encourage from the tangrams. Primary students can design their own tangrams with puzzle pieces in shapes determined by the when they have been creative, what enhances or limits

### CAREER DEVELOPMENT

Invite parents to discuss how they use creative thinking either at home or in the workplace. Create a list of questions for parents to address when speaking to the class.

#### COMMUNITY

shapes and creativity. Students identify how creativity may be Identify occupations in the community that involve work with used in career areas of interest to them.



**MATHEMATICS** 

#### **ASSESSMENTS**

identifying how they are alike or different from the ones in the story. Students identify by name, the shapes they used in th feacher evaluates finished tangram projects with the class, ACADEMIC CONTENT STANDARD

## **WORKPLACE COMPETENCY**

tangram projects.

# THINKING SKILLS: CREATIVE THINKING

Evaluate the tangram pictures, sconing points for creativity ar use of all the shapes. Students identify three ways in which they demonstrated creativity.

#### **EXTENSIONS**

- Students could write a story about their special tangram creations.
- Students could create something from tangrams that would be useful in their everyday life.

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Making Standards Work • Mathematics • Page 13 b



WORKER QUALITIES
Demonstrates the characteristics
of an effective worker W.Song. Tildistods & 7 ISQUEN LIES ! isologora ios TECHNOLOGY SKILLS
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with a variety of technologies tooonge senay Signanen THINKING SKILLS
Demonstrates the ability
to use reasoning OURION Gurunt enters EUNEM LOSOED Canos usagio ORGANIZATIONAL SKILLS
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efficiently operate within a workplace Gujenes OLYMINI SUBJECT " z. S&ANOS@H GUISN COMMUNICATION SKILLS
Demonstrates the ability to receive and relay
information clearly and effectively GUDENSIED Culerosen Guierden) measure, apply the results in problem-solving situations, and communicate the reasoning used in perimeter, capacity, weight, time, and familiar objects to develop a sense of **GRADES K-4** using the approximate measures of standard and non-standard units of comparing and ordering objects according to measurable attributes BENCHMARKS measurement in problem-solving selecting and using appropriate a. knowing, using, describing, and estimating measures of length, measuring and explaining the demonstrating the process of concepts related to units of solving these problems. measurement measurement temperature situations

Making Standards Work • Mathematics • Page 14 a



7 situations, and communicate the reasoning used in 5. Students use a variety of tools and techniques to £ measure, apply the results in problem-solving



a. knowing, using, describing and estimating measures of length, perimeter, capacity, weight, time, and temperature

solving these problems.

Worker Qualities: Responsibility follows through consistently with honesty and

#### QUOTATION

provided an avenue for relevancy in content standards. All of this ... Integration makes learning relevant. School-to-Career has helps students make positive choices for their future." - Tori Merrits, Vice President Jefferson County School Board

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### LEARNING ACTIVITIES

# ACADEMIC CONTENT STANDARD

Students apply a variety of math concepts in activities that use

- Students complete an assignment on money. spelling or vocabulary words.
- Each letter of the alphabet is assigned a monetary value Students calculate the value of various words or Students have \$100 to spend.
  - (2) Students complete an assignment on area by writing each sentences, using calculators as well as a paper and Denci
- Students total up the filled squares to determine the area of the word. They count the sides of each square used to letter of a word in a square on a piece of graph paper. total up the perimeter, .....

### **WORKPLACE COMPETENCY**

# **WORKER QUALITIES: RESPONSIBILITY**

bridge, etc.). The Teacher will then move the discussion to the topic of responsibility. The class will make a list of responsible measuring the classroom or cafeteria. The class will discuss why precision in measurements is so important (design of a Students work in groups of four collaborating on the task of behavior that might include:

- · paying attention to detail
- behavior response in a group
- and completing tasks in a timely manner.

### CAREER DEVELOPMENT

might discuss their responsibility to measure accurately and the Invite building architects, farmers, landscapers, etc. to discuss how they use the concept of area and perimeter as well as the skill and education requirements for their careers. They also possible consequences of inaccuracy.

#### **LINDWWOO**

etc. to figure out the largest number of students that can sit in the cafeteria. Interview the food service workers to determine Arrange a study trip to the cafeteria to measure tables, trays, how various measurement tools are used in their profession.

#### **ASSESSMENTS**

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**MATHEMATICS** 

ACADEMIC CONTENT STANDARD

accuracy of area and perimeter measurements of the assigned measurements of words. Assess student groups on the Assess students individually on the area and perimeter room, as well as on behaving responsibly in a group.

### **WORKPLACE COMPETENCY**

# WORKER QUALITIES: RESPONSIBILITY

cooperation and responsibility worked or did not work and why. Students self evaluate the group using the list of responsible behaviors. Students identify the responsibilities of individual group members and how their work affected the group as a whole. Students also determine what aspects of group.

#### **EXTENSIONS**

Use this activity for spelling practice by assigning a value to each letter in the alphabet (i.e., A=1, B=2, etc.)

example: 3 1 20 CAT = 24

Use spelling words to evaluate the students' understanding of time, measurement, number facts or money. Each letter may equal a value of time, measurement, or money (i.e., seconds, inches, or dollars).

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Academic Content Standard  Academic Content Standard  Communication and the concepts as they develop and use computational techniques, including estimation, mental administrates the ability to receive and relay develop and use computational techniques, including estimation and and are computational techniques, including estimation and and are computational techniques, including estimation and are computational techniques, including estimation and the concepts and communicate the reasoning used in solving these problems.  CERADES K-4  BENCHMARKS  A demonstrate site ability to receive and relay inclined and concepts and communication and demonstrates the ability to receive and relay information detail or an electromy and ellectricity operations and communicate the reasoning used in solving these problems.  A demonstrate the ability to receive and relay information detail or an electromy and ellectricity operation and ellectricity operations and communicate the reasoning used in a electromy and ellectricity operations and common techniques and documents using physical models  BENCHMARKS  A demonstrates the ability to receive and relay information detail and ellectricity operations and documents using physical models  BENCHMARKS  COMMUNICATION SKILLS  ORGANIZATIONAL SKIL	demonstrating understanding of and proficiency with basic addition, subtraction, multiplication, and division lads without the use of a calculator constructing, using, and explaining procedures to compute and estimate with whole numbers	selecting and using appropriate methods for computing with whole numbers in problem-solving end in problem-solving pencil, merital antihmetic, estimation, calculator, and computer methods
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selecting and using appropriate methods for computing with whole numbers in problem-solving situations from among paper-and-pencil, mental arithmetic, estimation, calculator, and computer



identifies, organizes, plans and allocates Organizational Skills: Using Resources resources

#### RESOURCE

Curriculum materials in mathematics, science, technology, history, mutticultural, at risk students, special education, and reading/literature, can be ordered through the following non-profit organization:

3505 Cadillac Avenue, Building F-9 Costa Mesa, CA 92626-1443 Saddleback Educational, Inc. info@sdlback.com (e-mail) (714) 545-1108 (fax) (714) 540-4010

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# Similar Similar

**LEARNING ACTIVITIES** 

# **MATHEMATICS**





# ACADEMIC CONTENT STANDARD

Students turn in their budgets, their estimate of expenses, a mathematically reconcile a check register, staying within the accurately completed check registers for a week's worth of transactions. Students accurately develop a budget and

### **WORKPLACE COMPETENCY**

budget.

having the class create a budget which includes these items:

 allowing guided practice on check register rent (a desk, desk with chair, chair only) transportation (bus, parent, bike) food (sack lunch or school lunch)

check register by:

Teacher introduces the concept of a budget and the use of a

ACADEMIC CONTENT STANDARD

# ORGANIZATIONAL SKILLS: USING RESOURCI

Students estimate their expenses for a week. At the end of the

recreation (recess, games, television, movie).

week, they calculate how close their estimation was to the

actual cost

- Evaluate the students on their ability to: define the word resources
- list what resources were used to develop a budget and us check register
  - list what resources are needed to prepare for class.

tire, need cold medicine, etc.).

#### **EXTENSIONS**

importance of a budget. Class compiles questions concerning ORGANIZATIONAL SKILLS: USING RESOURCES

**WORKPLACE COMPETENCY** 

the need for and use of a check register. Students identify Have a class discussion on the concept or research the

resources that are needed to set up a budget.

Students set up a budget for one week using the same categories as in the estimation activity (fumiture rental, transportation to school, food, and recreation).

miscellaneous expenditures out of a hat each day (i.e., fla students have emergency expenses. Students can draw · Expand the activity to include a process for loans when

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bank to discuss whether each student would receive a "loan"

based on their weekly expenses and their income

(allowance)

Each student will identify something they would like to buy and apply for a "loan". Invite a loan executive from a local

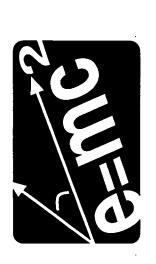
Students interview parents regarding how they budget for

their household expenses.

CAREER DEVELOPMENT/COMMUNITY

Making Standards Work  $\cdot$  Mathematics  $\cdot$  Page 15b

# GRADES 5-8



# III. INTEGRATION MATRICES AND CLASSROOM ACTIVITIES

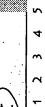
CLASSROOM ACTIVITIES
INTEGRATING MATHEMATICS STANDARDS
WITH WORKPLACE COMPETENCIES





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connectating meaning to integer  supports, against rock and p(iii)  supports, agains rock and p(iii)  supports agains rock and p(iii)  supports agains rock and p(iii)  supports agains rock and p(iii)  support around unables and settled  1. 2. 4. 5 and p(iii)  support around unables and supports and supp	GRADES 5-8 BENCHMARKS	Gilla St.	Story	) all	To the state of th		126		Sofie Land	THE SHOP SHOP	COALL SETTE	18	CHASS LESSE	OUNDEN! ON BEST	Older Stille	15	12	S. Adio	THE TO STORE	% \ % \	Day I vo	18 1/1	8/6/	18 10gg	Till Till Glad	1 TEDES	T. S. B.
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applying number theory concepts to represent numbers in various ways in various ways the relationships among the relationships among the relationships among the relationships among proportion, in problem-solving saliulations and protein and equalium or on-pictures about properties of integers and attorial numbers of existing the resonableness of advisors to be celimate and justify the resonableness of advisors to properties of integers and attorial numbers and advisors to properties of integers and attorial numbers and advisors to properties of integers and attorial numbers and common integers and advisors to properties of integers and advisors to provide advisors to pro			•	•					_	•						•			_		- · · · · · · · · · · · · · · · · · · ·						
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	using number sense to estimate and justify the reasonableness of solutions to problems involving integets, rational numbers, and common irrational numbers such as \lambda \. \l			·						•		•		•		•	-				•				5		





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Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems

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using the relationships among fractions, decimals, and percents, including the concepts of ratio and proportion, in problem-solving situations



Organizational Skills: Using Resources identifies, organizes, plans and allocates resources

#### RESOURCE

careers, ranging from a helicopter pilot, an architect, a police officer, and a firefighter, to machinists and welders, show how Math at Work. Thirteen women who work in non-traditional they use mathematics as part of their work. (Color Video, Resource Guide)

This and other resources can be ordered through:

ceramic or linoleum installer, etc.). Students contact the city for information on permits, inspections, and the cost of the permits.

materials. Students contact contractors to determine labor

costs (plumber, electrician, carpenter, drywaller, painter

Students contact hardware stores to determine the cost of

CAREER DEVELOPMENT

Students also will gather information on careers in the construction field including qualifications, training and the use

1025 West Johnson Street, Room 964 University of Wisconsin - Madison Center on Education and Work Madison, WI 53705-1796 School of Education www.cew.wisc.edu (800) 446-0399

# **MATHEMATICS**



#### **ASSESSMENTS**

#### ACADEMIC CONTENT STANDARD Evaluate students on their ability to:

- accurately complete a scale drawing of the bathroom (
- accurately calculate the ratios and proportions used fo scale drawing

linoleum. Discuss how math concepts are used to measure the

(to scale) that includes a sink, toilet, tub, ceramic tiles and

present their designs by completing a teacher-provided form

(which will show a way to compute square feet)

materials and design a layout for the bathroom. Students

Introduce a planning scenario and identify the steps involved in

ACADEMIC CONTENT STANDARD

LEARNING ACTIVITIES

designing a bathroom. Have the students design a bathroom

- calculate the cost of materials and labor needed for the bathroom
  - accurately measure the materials to be used in the bathroom.

## **WORKPLACE COMPETENCY**

ORGANIZATIONAL SKILLS: USING RESOURCES Class discusses the methods used in scale models and the

**WORKPLACE COMPETENCY** 

compile a list of contractors and the materials needed to

draw a scale model of the bathroom

students then:

complete their project by using available resources (i.e.,

· identify types of resources needed for the project and

providers of these resources are discussed.

determine how to allocate resources for their design

newspapers, ads, stores, phone books, etc.)

ORGANIZATIONAL SKILLS: USING RESOUR Evaluate students on their ability to:

identify resources

- accurately and completely list of resources such as mate
  - suppliers, contractors, city officials
- identify the method used to gather data

# identify the method used for allocating resources

#### **EXTENSIONS**

Create a 3-dimensional scale model of the design.

#### **LINDWWOD**

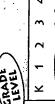
Invite contractors to visit the classroom to discuss how they bid a job and the tools they use. Invite city inspectors to discuss aspects of their job. The class could visit a construction site, participate in Habitats for Humanity; build the school a fence, garden, etc. Career information should also be gathered through these activities.

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numbers, shapes, data, and graphs in problem- soving situations and communicate the reasoning used in solving these problems.	robiem- reasoning		Demonstrates the ability to receive and information clearly and effectively	onstrates the ability to receive and information clearly and effectively	to receive a	ind relay ely	Oen	Demonstrates skills to effectively and efficiently operate within a workplace	s skills to erate with	effective nin a work	ly and place		Demon	Demonstrates the ability to use reasoning	he ability oning		Dem	onstrates n a variet	Demonstrates the ability to work with a variety of technologies	y to work ologies	ä	monstra of an	onstrates the character of an effective worker	Demonstrates the characteristics of an effective worker
GRADES 5-8 BENCHMARKS	Guil of S	G. Jage B. S.	I SHE	Guigio General Constitution of the Constitutio	1.00	Capacio	THE THE GET EN STATE OF THE STA	185 / 186 /	ALL 1878	180	Sunos using	913 Mg	TONIN SILLE	15/2	1.36	Cologi Scales		10 1 10 m	8 7	10 C.	18 1 TOS.	Tillow of	J'age	Tigle Acc
<ul> <li>representing, describing, and analyzing pattems and relationships using tables, graph's, verbal rules, and standard algebraic notation</li> </ul>	•				- 9/9000 A0650 A				<b>.</b>	<u>, 222, 234, 234, 244, 2</u>			<u> </u>					C. 2006/2008/00		* 3 Sab 201388* 4				
<ul> <li>describing patterns using variables, expressions, equations, and inequalities in problem-solving situations</li> </ul>										•			•	•			-				-	_		
c. analyzing functional relationships to explain how a change in one quantity results in a change in another			•									•	•	•										Paragraph (Control
<ul> <li>distinguishing between linear and nonlinear functions through informal investigations</li> </ul>			•								_		•	•										
e. solving simple linear equations in problem-solving situations using a variety of methods											•		• .	•	•	•					7.00			
09											Grand Andrews Grand Grand Frank Street							2.33		0.80. ·	<b>3</b>		\$2 8. v	1999





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Students use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data, and graphs in problemsolving situations and communicate the reasoning used in solving these problems.



representing, describing, and analyzing patterns and relationships using tables, graphs, verbal rules, and standard algebraic notation



Communication Skills: Interpreting delineates and analyzes oral and written information and synthesizes information into a conclusion

#### QUOTATION

performance analysis of the most complex computers systems. "Math is the most universal of all subjects and is spoken in one form or another by everyone. It ranges from simple functions In working with design engineers on product development, I use math on a daily basis. It is critical to be accurate in calculations of component performance, as well as cost like measuring ingredients for recipes, to full systems projections for systems production." Sales Associate Kent Electronics, Inc.

TINDWWOO

establish insurance rates. Incorporate career information into

these visits.

Visit an insurance agent and investigate how math is used to

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# BEMIS BEMIS BEMIS

**LEARNING ACTIVITIES** 

# **MATHEMATICS**



### **ASSESSMENTS**

Evaluate students on their summary paper and/or presentation. **ACADEMIC CONTENT STANDARD** The paper and/or presentation must include:

- supporting facts
- a graph (including the interpretation of that graph)

statistics

actuarial tables and data. Student teams construct a table that displays insurance rates for teenagers for the past 10 years with a written conclusion of what the rates indicated.

Students discuss the pros and cons of high insurance rates for

ACADEMIC CONTENT STANDARD

teenagers. Using different resources, students research

### mathematical patterns in insurance rates from year to year any other reasons to support their findings.

Based on the summary paper and/or presentation, evaluate COMMUNICATION SKILLS: INTERPRETING students on their:

**WORKPLACE COMPETENCY** 

Students discuss the skills used in interpreting including cause

COMMUNICATION SKILLS: INTERPRETING and effect. Students then research insurance rates in the

**WORKPLACE COMPETENCY** 

media center. . In.a summary paper or presentation, students.

explain why teenagers' insurance rates are higher, providing

several reasons. Based on current insurance rates for

- interpretation of cause and effect ability to analyze information
- supporting facts for predicting future insurance rates

(either rising, falling or stable) to predict future insurance rates.

teenagers, students analyze patterns from the last three years

- development and conclusion with supporting data
- · identification of two other aspects where interpreting is required in their life.

#### **EXTENSIONS**

driving, aggressive behavior, mortality concepts (life and death uses the skill of interpreting information on the job. Information

decisions) and tickets. Have the speaker discuss how he/she

on job requirements, skills and training should also be

Invite professionals such as an insurance agent, police officer,

CAREER DEVELOPMENT

or police detective to discuss the hazards of drinking and

- Students select an issue presented during the police station visit and create a presentation (poster, transparency, video, etc.) addressing the pros and cons of that particular issue.
- procedures the police use regarding drinking and driving. · Visit a police station, jail or holding cell to discuss what

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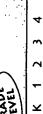
Making Standards Work • Mathematics • Page 17 b



Academic Content Standard
3. Students use data collections and analysis, statistics,

and probability in problem-solving siluations and communicate the reasoning used in solving these problems.	Ning these		C Demons infe	OMMUN strates the ormation	COMMUNICATION SKILLS Demonstrates the ability to receive and r information clearly and effectively	N SKIL o receive nd effecti	LS and relay vely		ORGANIZATIONAL SKILLS Demonstrates skills to effectively and efficiently operate within a workplace	VIZATI( Ites skill: operale	ONAL S s to effect within a	SKILLS ctively an workplac	P 8	ā	THINK emonstr to use	THINKING SKILLS Demonstrates the ability to use reasoning	ability ng		Signal Signal	nstrates t a variety	Demonstrates the ability to work	to work plogies	ă	monstra of an	nonstrates the characterist of an effective worker	Demonstrates the characteristics of an effective worker
GRADES 5-8 BENCHMARKS	E.H.I.ORS!	138	Gina	Tage		1 ~		TIGH OS BLOW OLLY	Securos et gires	35 \ 38 \	GLALINI ST. ST.	Sund in the state of the state	Sugan Losped	Surginite of Surgery to Surgery t	GUALANA GUI	Citishen	Sirienen	GUGE STREET	7 Y Y	36 / 18	BALL	16 16 1	te l'ade	Tillarely	N STORE S	Tielenio .
<ul> <li>reading and constructing displays of data using appropriate techniques and appropriate technology</li> </ul>			•			COMMONS				\$733,T\$\$Q	•						•	•	*							
b. displaying and using measures of central tendency, such as mean, median, and mode, and measures of variability, such as range and quartiles															•								, i			
c. evaluating arguments that are based on statistical claims				•						•	•	• (		•	•											
d. formulating hypotheses, drawing condusions, and making convincing arguments based on data analysis	•		•	_	•			_			•	•	•	•	•	•		_								
e. determining probabilities through experiments or simulations											•			•								1: 323532 7/3/3/3/2/2				
making predictions and comparing results using both experimental and theoretical probability drawn from reat-world problems				•							•	•		•	•	•	_			<u>.</u>			_			
g. using counting strategies to determine all the possible outcomes from an experiment	64			1 1 1			Pin A				•	•				•	X.		<u> </u>			<del></del>	· · ·	65	10	





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statistics, and probability in problem-solving situations and communicate the reasoning used in 3. Students use data collections and analysis, solving these problems.



a. reading and constructing displays of data using appropriate techniques and appropriate technology



Technology Skills: Applies Technology understands overall intent and proper procedures for using selected technology and equipment

#### RESOURCE

association of mathematics educators in the world. NCTM offers National Council of Teachers of Mathematics (NCTM) has been school, middle school, high school, and college and university vision, leadership, professional development, and avenues of communication for mathematics educators at the elementary dedicated to improving the teaching and learning of mathematics. NCTM is the largest nonprofit professional

Invite a "polling" or "survey group" to class to describe how they

the type of career that would produce that graph (population Students collect graphs from a variety of sources and define

CAREER DEVELOPMENT

studies, stock market, health statistics, market sales, etc.).

describe and demonstrate how data can be skewed to support

create fair surveys and present data fairly. They also could any argument and how graphs and statistics can distort "the Through an organized presentation, either oral with supporting

COMMUNITY

data or written using data and graphs, introduce the new seventh grade class to area businesses to promote

opportunities for job shadowing.

National Council of Teachers of Mathematics Reston, Virginia 20191-1593 (703) 620-9840 infocentral@nctm.org (e-mail) 1906 Association Drive (703) 476-2970 (fax) www.nctm.org

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## Emis Emis Emis

LEARNING ACTIVITIES

# **MATHEMATICS**



### **ASSESSMENTS**

# ACADEMIC CONTENT STANDARD

Evaluate the students on:

Through quick class surveys, using various survey techniques

**ACADEMIC CONTENT STANDARD** 

(raise hands, venn diagram, student surveys), practice and

define uses for line, bar, and pie graphs. Practice writing

questions and responses for a survey, interpreting graphs and

making predictions from given graphs.

Students decide how best to survey the entire 7th grade class

by creating a survey with the appropriate questions to define the "average" 7th grader (i.e., amount of time spent watching

television, playing sports, interests, etc.).

**WORKPLACE COMPETENCY** 

- creating a survey with appropriate questions
- tallying results
- drawing three meaningful conclusions from the data and graphs.

Evaluate students on their use of a computer to:

- enter data from a survey in a previously established database

## **WORKPLACE COMPETENCY**

TECHNOLOGY SKILLS: APPLIES TECHNOLOGY

- use data in database to select the most appropriate graph for the information
  - produce a quality graph appropriate for the information.

Describe and discuss the types of technology that can be used

for data analysis and display. Students enter data into a

TECHNOLOGY SKILLS: APPLIES TECHNOLOGY

and in written form, explaining which form is most appropriate

for the given data. Students use the graphing calculator and computer database and feam to display data in graphic form

computers for data displays and manipulations.

#### 29

Making Standards Work • Mathematics • Page 18 b



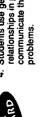
Academic Content Standard

relationships in problem-solving situations and communicate the reasoning used in solving these problems.	tions and solving these	Demor	COMMUNICATION SKILLS Demonstrates the ability to receive and relay information clearly and effectively	ACATION ability to re	SKILLS ceive and r effectively	relay	ORG/ Demonst	ORGANIZATIONAL SKILLS Demonstrates skills to effectively and efficiently operate within a workplace	NAL SI to effecti vithin a w	KILLS ively and orkplace		THII Demo to	THINKING SKILLS Demonstrates the ability to use reasoning	SKILLS the abilit oning		TE. Dem	CHNOL Instrates I a variety	TECHNOLOGY SKILLS Demonstrates the ability to work with a variety of technologies	KILLS y to work ologies	ŏ		WORKER QUALITIES Demonstrates the characterist of an effective worker
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GRADES 5-8 BENCHMARKS  a. constructing two- and three	AN THE SE	10 N	SON CURINA	• NOON	Nag.	<b>6</b> , \	S GUST	<b>18</b> 2	%\ <u>```</u>	9879 <u> </u>	Negy _	Tues .	<b>%</b>	eg. \	No.	9/4	So	7/L	6.	g,		876 808 67 614 614
dmensional models using a Variety of materials and tools	6				•				•	*	<u>.</u>		•									
b. describing, analyzing, and reasoning informally about the properties of two-and three-dimensional figures	•	•	•									•	•									
c. applying the concepts of ratio, proportion, and similarity in problem-solving situations			•						•				•									
d. solving problems using coordinate geometry									•			•	•				<del></del>			•		
e. solving problems involving perimeter and area in two dimensions, and involving surface area and volume in three dimensions									•				•									
It transforming geometric ligures using reflections, translations, and rotations to explore congruence	25							•	•				•						_			
89										<u> </u>												တ

Making Standards Work • Mathematics • Page 19 a



4 Students use geometric concepts, properties, and relationships in problem-solving situations and communicate the reasoning used in solving these





constructing two- and three-dimensional models using a variety of materials and tools æ



generates new and innovative ideas Thinking Skills: Creative Thinking

#### QUOTATION

were going to build a box to put things in, you would have to know the volume. I think math is really fun once you get the hang of it." "You need math for lots of things. If you are going to put up a fence, you would have to know the area and perimeter. If you

- Douglas, 5th Grade Jefferson R-1

### LEARNING ACTIVITIES



# **ASSESSMENTS**



**MATHEMATICS** 

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# ACADEMIC CONTENT STANDARD

Students use shapes and angles to create a vertical structure using 16 ounces of spaghetti noodles and glue. Students will test the structures to determine the weight they will hold. Students will:

- work in small groups
- design a blue print design
- devise as many solutions as possible.

## **WORKPLACE COMPETENCY**

# THINKING SKILLS: CREATIVE THINKING

list basic solutions for structures in architecture. Students also Students brainstorm on the elements of creative thinking and determine the pros and cons to each solution and select the best design solution using structural concepts and creative

### CAREER DEVELOPMENT

Bring in resource persons such as a structural engineer or an architect. Discuss how geometric concepts are used in these careers and the skills needed to be successful.

#### COMMUNITY

Students take a study trip to a construction site to meet with a structural engineer, architect or examiner with the city. incorporate career information into the study visits.

#### ACADEMIC CONTENT STANDARD Evaluate students on their ability to:

design a blue print of the structure to scale

- build a structure out of spaghetti and glue
- evaluate the structure by the amount of weight it holds
- explain in writing why they made the structure the way they did, why it will be stronger than other designs and provide · identify ways to strengthen the structure justification.

### **WORKPLACE COMPETENCY**

#### THINKING SKILLS: CREATIVE THINKING Evaluate the students on their ability to:

- · describe how creative thinking is used in the design of architectural structures
- brainstorm possible solutions
- select and implement a solution
- evaluate effectiveness and creativity of structure
- · identify three elements of creative thinking used to design architectural structures team participation
  - · identify two other times that creative thinking was used outside of school to solve a problem

#### EXTENSIONS

This activity could be integrated with a science class activity to explore laws of gravity, science, etc.

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Making Standards Work • Mathematics • Page 19b



Demonstrates the characteristics of an effective worker WORKER QUALITIES 18QUEN USE ! ILOUIS COLON ILOS TECHNOLOGY SKILLS
Demonstrates the ability to work
with a variety of technologies Our RAILES SECT GOOJIGET SAIGHT Coopy Spains TORIBIT ISTITUDO Demonstrates the ability THINKING SKIFFS to use reasoning OURHOUS Surini evices Sunem LOSOS O ORGANIZATIONAL SKILLS
Demonstrales skills to effectively and
efficiently operate within a workplace Gujenes; OLYMINI SUBJECTS \* Seconosed Guen COMMUNICATION SKILLS
Demonstrates the ability to receive and relay information clearly and effectively Sunerosen. Cinercial Cureas Outlessi measure, apply the results in problem-solving situations, and communicate the reasoning used in selecting and using appropriate units and tools to measure to the degree of area, volume, capacity, weight, mass, **GRADES 5-8** describing how a change in an object's linear dimensions affects its estimating, making, and using direct developing and using formulas and procedures to solve problems involving measurement **BENCHMARKS** estimating, using, and describing measures of distance, perimeter, describe and make comparisons reading and interpreting various scales including those based on number lines, graphs, and maps and indirect measurements to perimeter, area, and volume solving these problems. and angle comparison

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accuracy required in a particular

problem-solving situation

Making Standards Work • Mathematics • Page 2O a



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situations, and communicate the reasoning used in Students use a variety of tools and techniques to measure, apply the results in problem-solving solving these problems.



developing and using formulas and procedures to solve problems involving measurement



identifies and recognizes a problem, considers alternatives, devises and implements a logical Thinking Skills: Problem Solving plan of action

### DUOTATION

because you are learning -- you only solve problems that were solved before. In careers in science and engineering that "Math is like a puzzte. You have something exciting you want to do, you use the rules of mathematics to find the answer. In answer is a discovery because nobody's found the answer school, the answer is an answer everybody got before

-Dr. Amar Bose Chairman, BOSE Corporation

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## Similar Similar

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LEARNING ACTIVITIES

## **MATHEMATICS**





### **ASSESSMENTS**

### ACADEMIC CONTENT STANDARD Evaluate students on their ability to:

- identify the process to determine volume
- · determine volume of a classroom
- discover the volume of the chosen object
  - write a summary of the activity.

how many of those objects will fit into the classroom. Students: of some other object. For example, students may measure the

 use many math skills to complete this task convert everything to cubic inches or feet work in small groups as a team member

volume of a shoebox or some other object and then calculate

determine the volume of their classroom by finding the volume

Student teams problem solve how to find the best way to

ACADEMIC CONTENT STANDARD

## **WORKPLACE COMPETENCY**

THINKING SKILLS: PROBLEM SOLVING Evaluate the students' ability to:

- · identify the steps for problem solving identify problems using volume
- · identify two ways that problem solving is used in the workplace.

### EXTENSION

processes are discussed and the class comes to a consensus

on the best problem solving process.

these with the class. Similarities and differences among the

develops a process that incorporates the steps and shares

Teacher reviews the steps in problem solving. Each team

THINKING SKILLS: PROBLEM SOLVING

WORKPLACE COMPETENCY

This activity also address benchmark a.

distance, perimeter, area, volume, capacity, weight, mass, a. estimating, using, and describing measures of and angle comparison

As a class, brainstorm careers that require workers to calculate

CAREER DEVELOPMENT

important on the job. (For example, a nurse calculates dosage

volume, area, weight, mass, etc. and why this ability is

of medication based on weight of patient; a shipping company goods; industrial engineers design containers to hold a variety

workers determines the size of the fleet needed to transport

25

Invite a pharmacist, nurse or medical professional to discuss

medication and measurement issues.

Invite someone from the Environmental Protection Agency

**TINDWWOD** 

of objects).

(EPA) to the classroom to discuss air pollution and how

agency employees measure the volume of particles.

Incorporate career information into the presentation or visit,

including qualifications, skills and working conditions.

Visit a manufacturing plant to see how goods are put into





calculators, and computers, in problem-solving situations and communicate the reasoning used in solving these problems.	-solving ing used in		Demonstrates the ability to receive and re information clearly and effectively	onstrates the ability to receive and information clearly and effectively	to receive a and effectiv	and relay ely	effici	Demonstrates skills to effectively and efficiently operate within a workplace	skills to el ate within	ectively a a workpla	are	Š	Demonstrates the ability to use reasoning	nonstrates the au to use reasoning	ć de		with a variety of technologies	with a variety of technologies	chnologie		70	of an effective worker	ive work	of an effective worker
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using models to explain how ratios, proportions, and percents can be used to solve real-world problems	•		<u> </u>					80 S CONT. WHEN	y ytakowa ini	<u> 300 4888088</u>	•			on in the state of			- 17 N. M. M. C. C. C. S.	(206)+15,13,638		14				
<ul> <li>b. constructing, using, and explaining procedures to compute and estimate with whole numbers, fractions, decimats, and integers</li> </ul>	•	•				_	_		•	•			•		<u>.</u>							_		
c. developing, applying, and explaining a variety of different estimation strategies in problem-solving situations, and explaining why an estimate may be acceptable in place of an exact answer					*				•	•	•	•	•						•					
d. selecting and using appropriate methods for computing with commonly used fractions and decimals, percents, and integers in problem-solving situations from among mental antihmetic, estimation, paper-and-pencil, calculator, and computer methods, and determining whether the results are reasonable.							•		•	•		•	•		•	•		•		<u> </u>	•			
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7 including estimation, mental arithmetic, paper-and-pencil, calculators, and computers, in problem-solving situations and communicate the reasoning used in solving these problems. Students link concepts and procedures as they Ŧ develop and use computational techniques, 0 S 4

 developing, applying, and explaining a variety of different estimation strategies in problem-solving situations, and explaining why an estimate may be acceptable in place of an exact answer

BENCHMARK



devising and outlining a process to achieve a Organizational Skills: Planning goal and timeline

### QUOTATIONS

## LEARNING ACTIVITIES

### **ASSESSMENTS**

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**MATHEMATICS** 

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## ACADEMIC CONTENT STANDARD

Evaluate the student travel logs on:

accuracy of mileage, gas prices, and totals

making three required stops. To estimate the time and money

Students use a map to plan a trip in the state of Coforado

ACADEMIC CONTENT STANDARD

required to complete the trip, students create a travel log for documenting car mileage, price of gas, cost for lodging and

- appropriate estimation of meals and lodging
- descriptions of exact/estimate costs of gas, meals, lodging with an accurate explanation of why each would be appropriate.

### ORGANIZATIONAL SKILLS: PLANNING **WORKPLACE COMPETENCY**

Using the travel log activity, students:

write the steps in the planning process used to complete the

how to get there (including what to pack, arranging the mode of

transportation, making required reservations).

students pick a destination and devise a step-by-step plan for

The teacher presents the steps involved in planning. Then,

ORGANIZATIONAL SKILLS: PLANNING

**WORKPLACE COMPETENCY** 

meals etc.

- identify how changes were made
- give two other examples of when a planning process should describe how the planning process could be improved

Invite a travel agency representative to describe how he/she plans trips, and to discuss requirements and opportunities in

CAREER DEVELOPMENT

Expand the above project to include travel to other states and

**EXTENSIONS** 

the cost of flying compared to driving. Incorporate airline services in the community/career development areas.

**2**3

Making Standards Work • Mathematics • Page 21 b

"Math is important because you will need it your whole life."

- Eric, 5th Grade

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their field.

Jefferson County R-1

Class produces a travel brochure for the neighborhood, city or

state, including color graphics and mileage information for

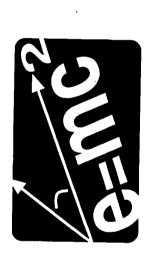
interest points, as well as information about lodging and

restaurants (with estimated price ranges).

"You use math everyday. When teachers teach math, they're helping prepare you for your future."

 Taylor, 5th Grade Jefferson County R-1

# GRADES 9-12



# III. INTEGRATION MATRICES AND CLASSROOM ACTIVITIES

INTEGRATING MATHEMATICS STANDARDS WITH WORKPLACE COMPETENCIES





and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.	ni besu g		Бетог	COMMUNICATION SKILLS Demonstrates the ability to receive and reinformation clearly and effectively	JNICAT he ability n clearly	ION SP v to recei	(ILLS) ive and ri ctively	elay	Demon efficien	OKGANIZA HONAL SMILLS Demonstrates skills to effectively and efficiently operate within a workplace	skills to ate withi	effective n a work	ly and tplace		Demo 10	Demonstrates the ability to use reasoning	the abil soning	À		Demonstrates the ability to work with a variety of technologies	emonstrates the ability to worf with a variety of technologies	bility to v chnologi	es	Оето	onstrates the character of an effective worker	the char ctive w	Demonstrates the characteristics of an effective worker
GRADES 9-12 BENCHMARKS a. demonstrating meanings for real numbers, absolute value, and scientific notation using physicat materials and technology in problem- solving situations b. developing, testing, and explaining	Que se la companya de la companya della companya della companya de la companya della companya de	1 3/8	O line	Gana Gana	Cue de la company	Gineral Constitution of the Constitution of th	a a a a a a a a a a a a a a a a a a a	1 0 ty	"GOLD OF THE STATE	*8. \	COLLIN SORRE	<b>%</b>	Gina to to the second	Gines is a	Sugar, Charles			Tolight days	Tolling States	7% \ 7% \ 2000 455 A 2	The state of the s	OLI BOLISH ISS		THORIZON OF THE PROPERTY OF TH	Tilles &	Qir. ano.	Rigorio Company
conjectures about properties of numbers number systems and sets of numbers cusing number sense to estimate and justify the reasonableness of solutions to problems involving real numbers		•	•				•					*			• • • • • • • • • • • • • • • • • • •	• •	200 / 100 /										
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Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.



c. using number sense to estimate and justify the reasonableness of solutions to problems involving real numbers

Thinking Skills: Decision Making uses a process to identify goals and constraints, evaluates alternatives and reaches a conclusion

### QUOTATION

"We were asked to develop a marketing plan for a local business. Not only was the assignment interesting, it also brought our class work to life. Now I really know why it's important to have good writing skills, and I actually used what I've learned in Math. Contributing to a real business also heightened our confidence, and it was gratifying. When we experienced the work world, we saw how we needed to strengthen our basic skills. Those skills are so important!"

Student, Loveland High School

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### ماااتی مااتی

## CACTIVITIES

## LEARNING ACTIVITIES

ACADEMIC CONTENT STANDARD

Students estimate the current market value of a real estate property. The estimate will be based on analysis of similar properties with respect to features, age, location, condition, and amenities.

## **WORKPLACE COMPETENCY**

## THINKING SKILLS: DECISION MAKING

Students develop a decision making model and use this model to establish criteria for estimation of property value. Students discuss the factors and processes that impact their estimate using the data collected and criteria.

### CAREER DEVELOPMENT

Invite an appraiser, realtor, and/or assessor to discuss current practices of their profession and answer students' questions.

### COMMUNITY

Conduct a walk-through tour of properties that are on the market with an appraiser or realtor.

### **ASSESSMENTS**

Similar Similar

**MATHEMATICS** 

## ACADEMIC CONTENT STANDARD

Compare the students' itemized evaluation of property to that of a professional's. Students can articulate or list the mathematical concepts used.

## WORKPLACE COMPETENCY THINKING SKILLS: DECISION MAKING

- Evaluate students on their ability to:
- Identify the decision making process
  - collect data
     organize of information
    - manage time.

### **EXTENSIONS**

This activity could be linked to social studies by discussing the politics behind the value of land. Students could provide a cost analysis and a scaled sketch of the property.





Academic Content Standard
2. Students use algebraic methods to explore, model,

numbers, shapes, data, and graphs in problem- solving situations and communicate the reasoning used in solving these problems.	blem- asoning		Demonst info	Demonstrates the ability to receive and rel information clearly and effectively	nstrates the ability to receive and information clearly and effectively	receive d effectiv	and relay rely	3	Demonstrates skills to effectively and efficiently operate within a workplace	operate	s to effe within a	ctively a workpla	문왕		Demonstrates the ability to use reasoning	nonstrates the ab to use reasoning	e ability ning			ionstrate th a varie	emonstrates the ability to wor with a variety of technologies	Demonstrates the ability to work with a variety of technologies	ž v	Demo	onstrates the character of an effective worker	the cha ective w	Demonstrates the characteristics of an effective worker
GRADES 9-12 BENCHMARKS a. modeling real-world phenomena using functions, equations, inequalities, and matrices	Cliff Bill St.	Eure ex		\ \*\delta_{Bill}		\ <b>~~~</b>		I BLI BOB LEN BLIST	Searnos es disconsideration of the season of	CLAUTER STATE STAT	Charles States	<b>№ № № № № № № № № №</b>	GLING COS LO COS	Charles O	an any	Q <sub>1</sub> A <sub>1</sub> A <sub>1</sub> A <sub>2</sub> A <sub>2</sub> A <sub>3</sub> A <sub>4</sub>	Shallana .		Gelevis sales	Good Selling	Coll Ballon 165	TO LING TO STATE OF THE PARTY O	(a) (a)	Tolling dogs of	Gildie of	QIN BOOK OF THE PROPERTY OF TH	St. Bard
b. representing functional relationships using written explanations, tables, equations, and graphs, and describing the connections among these representations.			•						*		•				•	• ;						•					
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e. interpreting algebraic equations and inequalities geometrically and describing geometric relationships algebraically	•						_				•														8		
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Students use algebraic methods to explore, model, numbers, shapes, data, and graphs in problem-solving situations and communicate the reasoning used in solving these problems. and describe patterns and functions involving



b. representing functional relationships using written explanations, tables, equations, and graphs, and describing the connections among these



understands the nature of systems, develops and adapts systems to meet organizational Organizational Skills: Systems Thinking

### QUOTATION

several different angles used in designing a skateboard as well skateboards. It's [the design] got to be perfect and to make it "I'm not just a woodcarver carving a hunk of wood. I design as figuring stress points to ensure it doesn't snap under a perfect, you have to use math and geometry. There are skateboarders feet and all of that is done because of mathematics." - Tim Piumarta Director, New Product Development Santa Cruz Skateboards

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### E-mc E-mc

LEARNING ACTIVITIES

## **MATHEMATICS**



### **ASSESSMENTS**

### ACADEMIC CONTENT STANDARD Evaluate students on their ability to:

accurately use algebraic methods

use the data they find to make tables and graphs by hand and

· develop equations to fit their graphs using graphing

calculators

by using a graphing calculator

make predictions using their graphs and equations

**WORKPLACE COMPETENCY** 

Students research any topic that features exponential growth

**ACADEMIC CONTENT STANDARD** 

(such as population growth) and do the following:

- find and use an example of exponential growth from their research
- develop accurate equations that fit their graphs using graphing accurately create tables and graphs from the data they use
  - · give valid predictions based on their graphs and equations. calculators

## **WORKPLACE COMPETENCY**

### ORGANIZATIONAL SKILLS: SYSTEMS THINKING Students list three criteria of a system. Students pairs then

- · identification of three systems that may be affected by present verbally or in written form the following:
- a list of other systems that affect their community.
- population growth

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Making Standards Work • Mathematics • Page 23 b

ORGANIZATIONAL SKILLS: SYSTEMS THINKING Discuss the concept of a system and brainstorm elements of a system. Students identify systems in the school, community and businesses.

Students retrieve census data from the Internet or library and Explore systems in the context of human population growth. then create tables and graphs that track data over time. Discuss the following questions:

- Does the data demonstrate exponential growth?
- Is the population growing exponentially at this time?
- How does population growth affect systems in our world (for example, environmental, business and industry, technological, sociological)?

### CAREER DEVELOPMENT

planners, environmentalists, etc.) to discuss the system in which Invite guest speakers from the community (traffic engineers, city they work and how population growth may affect the system. Have the speakers discuss their jobs and career paths, including skills needed and training required.

### COMMUNITY

Students research the growth of their neighborhoods, obtaining regarding this growth and how various systems affecting the plans or descriptions of the community from the past and comparing them to the present. Discuss the implications community have changed over time.



Academic Content Standard
3. Students use data collections and analysis, statistics,

communicate the reasoning used in solving these problems.	communicate the reasoning used in solving these problems.		Dетоп in	Demonstrates the ability to receive and I information clearly and effectively	he ability n clearly	y to recei		elay	Demor efficier	Demonstrates skills to effectively and efficiently operate within a workplace	skills to ate with	effective in a wor	ely and kplace		реп	Demonstrates the ability to use reasoning	es the a	ounty B		with a	with a variety of technologies	with a variety of technologies	ologies		9	of an effective worker	of an effective worker	ker
GRADES 9-12 BENCHMARKS a. designing and conducting a statistical experiment to study a problem, and interpreting and communicating the results using the appropriate technology	Q <sub>II</sub> s	1 78	Q <sub>III</sub>	OL VOIL	Cined of the state	Gilleria *		N / Qu	SOSTION OF STATE OF S	30. \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	TALL TO THE STATE OF THE STATE	<b>1</b> 8.	Clino, to bad	GINGS LIE	May Mills	\ T <sub>k</sub> \	L'ég	GE BIT BRILLOS	Year Stakes	<b>76.</b> \ <b>76.</b>	20 X 8	Tes Miles	(a) (b)	Taguage Toda	Elighton 1901	Rite By Co.	Gift State of the	T <sub>E</sub>
E. analyzing statistical daims for erroneous conclusions or distortions erroneous conclusions or distortions      Fitting curves to scatter plots, using informal methods or appropriate technology, to determine the strength of the relationship between two data cars and to make predictions				•																								
drawing conclusions about     distributions of data based on     analysis of statistical summaries     using experimental and theoretical																									<u> </u>			
probability to represent and solve problems involving uncertainty																												
<ol> <li>solving real-world problems with informal use of combinations and permutations</li> </ol>						en e																			- +			
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statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems. Students use data collections and analysis,

STATE



designing and conducting a statistical experiment to study a problem, and interpreting and communicating the results using the appropriate technology

devising and outlining a process to achieve a goal and timeline Organizational Skills: Planning

### RESOURCE

organization that offers K-12 teachers and other educators free resources available through the Internet or toll-free modem Eisenhower National Clearinghouse (ENC) is a non-profit information about mathematics and science curriculum access to ENC Online, in print through a vanety of publications, and on CD-ROM.

Eisenhower National Clearinghouse Columbus, OH 43210-1079 (800) 362-4448 (modem) info@enc.org (e-mail) (614) 292-2066 (fax) 1929 Kenny Road 800/621-5785

www.enc.org

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## LEARNING ACTIVITIES

## **ASSESSMENTS**

**MATHEMATICS** 

ACADEMIC CONTENT STANDARD Assess students on:

In groups of 3-4, students design a survey that includes at least

ACADEMIC CONTENT STANDARD

10 questions aimed at a specific topic that interests the group. The group then distributes the survey to a random sample of organizes and analyzes the results using appropriate statistical

applications and creates a variety of graphs to display the

students in the school. After the data is collected, the group

- the design and distribution of the survey
  - organization and analysis of the results
- appropriateness and accuracy of the graphs.

### ORGANIZATIONAL SKILLS: PLANNING WORKPLACE COMPETENCY

Students self evaluate their;

- · ability to identify examples of how the planning process is

participate in a job shadowing experience that connects math,

data collection and analysis.

results of their surveys with the school community. Students

Students create a bulletin board or newsletter to share the

COMMUNITY

used in these companies. The students also explore the skill

and experience requirements for careers in the market

research field

opinion, employee/customer satisfaction, etc. Students

Using the Internet or phone interviews, students research a variety of companies that use surveys for marketing, public examine how statistics and other mathematic concepts are

CAREER DEVELOPMENT

create tables and graphs for display.

organize and analyze the results

 distribute the survey design the survey

Making Standards Work • Mathematics • Page 24 b farme

used in specific businesses that work with market research · ability to identify the steps in a planning process ability to make adjustments where necessary plans and timelines

> The class discusses elements of planning and student teams devise and record a plan and timeline for their survey project.

ORGANIZATIONAL SKILLS: PLANNING

WORKPLACE COMPETENCY

The plan includes a day-by-day report of how long it will take

### EXTENSION

Students use a computer spreadsheet application to create the tables and graphs for the project

(Note: The sample rubric on page 28 corresponds with this activity)



4. Students use geometric concepts, properties, and relationships in problem-solving situations and

WORKER OUALITIES
Demonstrates the characteristics of an effective worker TECHNOLOGY SKILLS
Demonstrates the ability to work
with a variety of technologies ψ. ψ. \* Suguesten THINKING SKILLS
Demonstrates the ability to use reasoning BURNOUS Buyuul enicelo GLINEM LOS DE C ORGANIZATIONAL SKILLS
Demonstrates skills to effectively and efficiently operate within a workplace Outrius sueses Secunosed Cuist nonegener out COMMUNICATION SKILLS
Demonstrates the ability to receive and relay
information clearly and effectively Cuperosen communicate the reasoning used in solving these making and testing conjectures about geometric shapes and their **GRADES 9-12** measure perimeter, area, and volume using trigonometric ratios in problemproperties, incorporating technology finding and analyzing relationships among geometric figures using transformations in coordinate BENCHMARKS of regular and irregular geometric deriving and using methods to where appropriate solving situations systems

Making Standards Work • Mathematics • Page 25 a



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÷ 0 ∞ Students use geometric concepts, properties, and relationships in problem-solving situations and communicate the reasoning used in solving these

 $\stackrel{\sim}{\sim}$ 



using trigonometric ratios in problem-solving situations



Worker Qualities: Team Member contributes to group effort through cooperation and consensus

### QUOTATION

come together to teach our children essentials and assist them in becoming productive citizens. We must not fail our children. "School-to-Career encourages educators and community to If we do, we have failed as a society.\*

Member of Ignacio School Board Roger Phelps

## LEARNING ACTIVITIES

### ASSESSMENTS

**MATHEMATICS** 

## ACADEMIC CONTENT STANDARD

Students receive instruction on how to determine distances and information and prepare a final presentation to the class. (See (bleachers, football goal posts, etc.) by measuring angles and lengths and using trigonometric ratios. Students sketch the angles of elevation by measuring and using triangulation. Students find the attitude of various items around school, bleachers example in figure 1.)

## WORKPLACE COMPETENCY

WORKER QUALITIES: TEAM MEMBER

in teams, students decide who will do the following:

- measure items
- solve any problems encountered
- complete different aspects of the presentation (written report, oral presentation, sketch),

the pros and cons of this approach as well as the attributes of Students discuss what it is like to work on a team, identifying an effective team member.

### CAREER DEVELOPMENT

Students learn how to do self-evaluation on the problems they encounter during the project, a skill that is required in any occupation. Students interview several people in various careers to determine how they use problem solving and math on the job.

### **TINDWWOD**

Invite a local surveyor to share information about surveying, the his/her field and his/her own experiences with team work on the manner in which reports are prepared, and recommendations on how to adjust the students' reports to conform to an actual survey report. The surveyor also can share information about

## **ACADEMIC CONTENT STANDARD**

Assess students on the accuracy of their measurements, computations using trigonometric ratios and sketches. The presentation may be evaluated by other members of the class and/or self-evaluated.

## **WORKPLACE COMPETENCY**

WORKER QUALITIES: TEAM MEMBER

### Students write a summary of their efforts that answers the following questions:

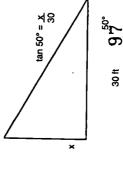
What was each team member's responsibility?

- What process (steps) did the team use to complete the assigned project?
- · What problems did the team encounter during the project and how were they solved?
  - What score should the team receive and why? (This score should be based on a rubric given to each student pnor to · What are the pros and cons to working on a team? beginning the assignment)
    - In what kind of situations is the team approach most

### **EXTENSIONS**

Survey the school property.

Figure 1 - Bleachers



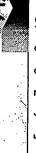
Making Standards Work • Mathematics • Page  $25\,b$ 

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measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.	alving ing used in		CO Demonstr infor	COMMUNICATION SKILLS Demonstrates the ability to receive and relay information clearly and effectively	ATION bility to rec arly and e	SKILLS eive and flectively	relay	ORC Demon efficien	ORGANIZATIONAL SKILLS Demonstrates skills to effectively and efficiently operate within a workplace	rionAL tills to eff te within	ORGANIZATIONAL SKILLS emonstrates skills to effectively an fficiently operate within a workplac	o ge	- ā	THINKING SKILLS Demonstrates the ability to use reasoning	THINKING SKILLS Demonstrates the ability to use reasoning	bility 9		TECHIN Demonstr with a v	TECHNOLOGY SKILLS Demonstrates the ability to work with a variety of technologies	TECHNOLOGY SKILLS )emonstrates the ability to work with a variety of technologies	0 g %	Demons	Demonstrates the characteristics of an effective worker	WOHKEH COALITIES  nonstrates the characterist  of an effective worker	teristics
GRADES 9-12 BENCHMARKS a. measuning quantities indirectly using techniques of algebra, geometry, or trigonometry trigonometry	Elliga,	Page of the state	1944	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Single .	No.	Segros and all so	<b>3. \ 3. \</b> \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	GALLI COME	18 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	GLING LOS CO.	Chaile and Control of the Control of	all	The state of the s	Goleji dajes	Toppy of States	<b>% \ %\</b> √3340303031	00 1 8 S	A THE STATE OF THE	16 \ 70.\ A A A A A A A A A A A A A A A A A A A	To the state of th	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Cite and Cit	T <sub>s</sub>
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measure, apply the results in problem-solving situations, and communicate the reasoning used in 5. Students use a variety of tools and techniques to solving these problems.



chooses appropriate procedures, tools or equipment Technology Skills: Selects Technology

selecting and using appropriate techniques and tools to measure quantities in order to achieve specified degrees of precision, accuracy, and error

نم

(or tolerance) of measurements

### QUOTATION

prepared for the working world as well as for higher education." focused. We have more community involvement with over 120 . . Because of School-to-Career, our curriculum is more partners assisting. We believe our students are better

 Harvie Guest, Superintendent Salida School District

**LINDWWOD** 

Invite a local construction worker to come in and help the class

use their measurement skills to build the classroom a

bookcase, table, etc.

accuracy to discuss the tools, techniques and equipment they Invite a doctor, scientist, auto mechanic, machinist, carpenter

about their careers and the education, skills, experience

required to work in their fields.

or others whose work requires high degrees of precision or use on the job. These speakers also will share information

CAREER DEVELOPMENT

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## **MATHEMATICS** BEMES BEMES BEMES

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## LEARNING ACTIVITIES

Using a variety of measuring tools, students measure the diameter of a cylindrical object. Students note and record the various degrees of precision for each tool and determine its

ACADEMIC CONTENT STANDARD

## ACADEMIC CONTENT STANDARD

**ASSESSMENTS** 

### Students complete a performance assessment that requires measurements within stated tolerances (levels of precision). several different objects. Students perform and record the them to choose from a variety of instruments to measure

## **WORKPLACE COMPETENCY**

another. Students identify an occupation that uses measuring precision tool works better for a specific measuring task than TECHNOLOGY SKILLS: SELECTS TECHNOLOGY technology for the job. This includes explaining why one Students identify the process used to select appropriate

TECHNOLOGY SKILLS: SELECTS TECHNOLOGY

**WORKPLACE COMPETENCY** 

Students learn about a variety of measuring tools and are

various levels of precision. Students select the appropriate provided with several industrial sample problems requiring

technology (measuring tool). Discuss and justify

appropriateness of each

tools and the skills required for the occupation.





Academic Content Standard 6. Students link concepts and procedures as they

CHADES 9-12  GRADES 9-12  GRADE	estimation, mental antimetic, paper-and-pensal, calculators, and computers, in problem-solving situations and communicate the reasoning used in	Nying 1 used in	Ded	Demonstrates the ability to receive and re information clearly and effectively	onstrates the ability to receive and information clearly and effectively	receive and d effectively	relay y	efficient	Demonstrates skills to effectively and efficiently operate within a workplace	s to effect within a w	orkplace		2	to use reasoning	soning		Ĭ.	with a variety of technologies	with a variety of technologies	nologies		of a	n effecti	of an effective worker	of an effective worker
and the control of th	GRADES 9-12	Gillar	\ Sibe \	Y Yang	\	1.24	CHILL	Hallagell Bills	185 / 186 /	18	THE SUSTEE	Sunen L.	Supply Supply	1.5%	12	Tellatto	Tele 1 80	TOUTON SOST	18 July Alles	10 1 6 1 C	in Today	Tillg dasi	T. Boker	QIL EBAIL	T.
subscript and tricing appropriate metabots to control by which read interests to control by which read interests to control by which reads to control by which around the read of control by the limitation of describing the limitation with assessing the amount of error reading from estimation, and assessing the amount of error reading from estimation within acceptable limits	using ratios, proportions, and percents in problem-solving situations			<u> </u>	C 1 (1) (1) (1) (1)					<u> </u>										•					
estimation, and assessing the amount of error resulting from estimation within acceptable limits  1.02			•	•					. •	•	•	•	•	•		•	•		•	<u>.                                    </u>	•				
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## 6

including estimation, mental arithmelic, paper-and-pencil, calculators, and computers, in problemsolving situations and communicate the reasoning used in solving these problems. Students link concepts and procedures as they develop and use computational techniques,



a. using ratios, proportions, and percents in problem-solving situations



identifies and recognizes a problem, considers alternatives, devises and implements a logical Thinking Skills: Problem Solving plan of action

### RESOURCE

12th grade. A collection of math and science videos, software, help schools and communities improve their math and science Broadcasting is a non-profit organization who's mission is to education programs for all students in kindergarten through The Annenberg Foundation and the Corporation for Public and materials are available through:

Annenberg/CPB Math & Science Project South Burlington, VT 05407-2345 (802) 864-9846 (fax) Department C-96 www.learner.org (800) 965-7373 P.O. Box 2345

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Semes Semes Semes

LEARNING ACTIVITIES





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## ACADEMIC CONTENT STANDARD

- Evaluate students on their ability to:
   accurately calculate ratios, proportions and percentages
   identify two other areas that use ratios, proportions and
  - percentages.

## WORKPLACE COMPETENCY

the amount of ingredients needed to feed various numbers of

Students use ratios, proportions and percents to calculate one

of the following:

ACADEMIC CONTENT STANDARD

the appropriate medication dosage for a variety of patients

the individual statistics of a ball player

## THINKING SKILLS: PROBLEM SOLVING

problem solving process. Students will describe, in writing, the Assess students on their ability to successfully follow the work completed in and the outcome of each step of the process.

### **EXTENSIONS**

brainstorm ideas for solving the problem, accepting all ideas

 discuss the appropriateness and usefulness of each idea try the technique and make any adjustments necessary identify alternatives if necessary and apply it to a concrete

evaluate the technique

identify all available resources (intemet, nurses, teachers,

Students learn and use the following problem solving process

to do the above activity:

 identify the problem calculator, etc.)

THINKING SKILLS: PROBLEM SOLVING

**WORKPLACE COMPETENCY** 

Take a study trip to a hospital or veterinary clinic to observe the

application of these skills

### CAREER DEVELOPMENT

care provider into the classroom as a guest speaker to discuss Invite a doctor, veterinarian, nurse, lab technician, or hospice solving on the job. The speakers also can share information how he/she uses ratios, proportions, percents, and problem about their own career paths and the skills/experience requirements for jobs in their fields.

### COMMUNITY

Students shadow a doctor, nurse or other health care provider and write a paper reflecting how ratios, proportions, percents, and problem solving are used in that profession.

Making Standards Work • Mathematics • Page 27b Carrio

## IV. SAMPLE RUBRIC

Standard 3 - Grades 9-12 This rubric is associated with the activity on Page 24b

Academic Standard:	Survey includes at least 10 questions on the same topic. A written description of the distribution process is included showing that the sample was random. The questions are clear and understandable. The statistical analysis of each survey question is accurate. The graphs are displayed neatly, colorfully and accurately.	Workplace Competency:	<ul> <li>The group has a complete plan and the plan and timeline are adjusted as needed.</li> </ul>
Proficient Academic Standard:	Survey includes at least 7 questions on the same topic. A written description of the distribution process is included. The questions are clear and understandable. The statistical analysis of each survey question may have 1-2 minor errors. The graphs are displayed neatly, colorfully and accurately.	Workplace Competency:	The group has a complete plan and follows a timeline.
Essential Academic Standard:	Survey includes at least 5 questions on the same topic. The questions are fairly clear and understandable. The statistical analysis of each survey question may have several errors. The graphs are included but may have errors.	Workplace Competency:	<ul> <li>The group has a very basic plan and the student does not always adhere to the timeline.</li> </ul>
In Progress Academic Standard:	The survey questions lack clarity. The statistical analysis and graphs are nonexistent or need many improvements.	Workplace Competency:	<ul> <li>The group has an incomplete plan without a timeline.</li> </ul>
Assessment Assessment Academic Standard:	Students use data collections and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems.  Benchmark c. designing and conducting a statistical experiment to study a problem, and interpreting and communicating the results using the appropriate technology	Workplace Competency: Organizational Skills: Planning	Planning, devising, and outlining a process to achieve a goal and timeline.



### SCHOOL-TO-CAREER REGIONAL RESOURCE CENTERS

The following resource centers were created to support Colorado communities in building local School-to-Career Partnerships. This support includes: materials, technical support, orientation and specific content presentations, and professional development opportunities. Please contact the center in your area for more information.

## Region 1 - Northern Colorado

Connie Long

Aims Community College

Continuing Education Division 5590 11th Street

Greeley, CO 80634 Phone: (970) 330-8008 X6740

(Counties: Larimer, Weld, Morgan, Logan, Sedgwick, Phillips, Washington, Yuma Elbert, Lincoln,

Kit Carson, and Cheyenne)

### Region 2 - Denver/Metro

Alice Potter

Public Education and Business Coalition

1410 Grant Street, Suite A-101

Denver, CO 80203

(Counties: Adams, Arapahoe, Boulder, Gilpin, Clear Creek, Jefferson, Denver, Douglas) Phone: (303) 861-8661

### Region 3 - Central Colorado

Ed Bowen

5675 South Academy Boulevard, Box 38 Pikes Peak Community College

Colorado Springs, CO 80906

Phone: (719) 540-7357 (Counties: Park, Chaffee, Teller, El Paso, Fremont, Custer, Pueblo)

## Region 4 - Southern Colorado

Julie Sumpter

Otero Junior College

1802 Colorado Avenue La Junta, CO 81050

Phone: (719) 384-6835

(Counties: Crowley, Kiowa, Otero, Bent, Prowers, Baca, Las Animas, Huerfano, Costilla, Alamosa, Conejos, Rio Grande, Mineral, Saguache)

## Region 5 - Southwestern Colorado

### **Barbara Milicevic**

Pueblo Community College

**Fele Tech Center** 

60 South Cactus Drive, Suite 1

Cortez, CO 81321

Phone: (970) 565-7536

Counties: Delta, Gunnison, Montrose, Ouray, San Miguel, Dolores, San Juan, Hinsdale, Montezuma, La Piata)

### Region 6 - Western Colorado

Darla Bennett

504-A 27th Street

Glenwood Springs, CO 81601

(Counties: Moffat, Routt, Jackson, Grand, Summit, Eagle, Lake, Pitkig, Mesa, Garfield, Rio Phone: (970) 947-0851

Blanco)

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# MAKING STANDARDS WORK EVALUATION

The Colorado Department of Education and The Colorado School-to-Career Partnership would appreciate your comments about *Making Standards Work*. Handbook.

Please take a minute to complete this evaluation.

ny suggestions for extending the use of this book?	r example: other areas of interest, additional activities, distribution)
IV. Any s	(for ex

Name	9	(optional)		Position		
Sch	School District	•				
Grac	Grade Level: Elem. Middle School High School	<u> </u>	High	School	Other	V. Are you a Making Standards Work author? Yes No
· 	Overall value of handbook:	Poor	Fair	Good	Good Excellent	
	1. Quality of information	-	8	က	4	To request additional copies of the Mathematics Handbook, please contact:
	2. Usefulness for educators	_	8	က	4	Career & Technical Education Resource Center of Colorado
	<ol><li>Format of information</li></ol>	-	0	က	4	1059 Yosemite Street, Bldg. 758, Room 117
						Aurora, CO 80010
=	A to the commence of the	•	•	•		phone: (303) 340-7350
<b>:</b>	Any confinence about now you adapted the lear	apted tr	ne leam	ing activ	ming activities to meet your	fax: (303) 340-7353
	icado.					www.indra.net/cterc

Number of students impacted by the classroom activities presented in this handbook. Approximately:

To return, please fold this evaluation in half so the address on the reverse side is showing, staple and mail. Thank you.

sb\_resource@cccs.cccoes.edu

Or E-mail:

\$-

Making Standards Work • Mathematics • Page 30 Fame

ERIC

Colorado Department of Education Attention: Heather Hotchkiss/Kelli Roark 201 East Colfax, Room 502 Denver, CO 80203



Staple Here



Colorado Department of Education 201 East Colfax Avenue Denver, Colorado 80203 (303) 866-6600



Colorado School-to-Career Partnership 1580 Logan Street, Suite 410 Denver, Colorado 80203 (303) 894-2060 \* Fax: (303) 894-2064 http://www.state.co.us/gov\_dir/ligov/schooltowork/index.html